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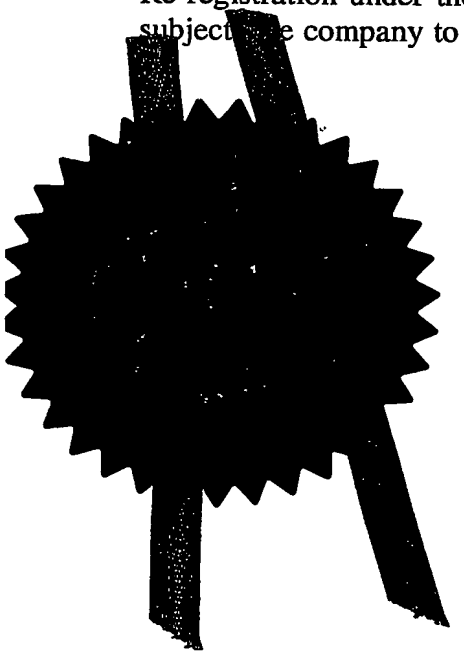

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Cardiff Road
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1. Your reference — SJW/9185

2. Patent application number *(The Patent Office will fill in this part)* — **0201552.7**

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

Cerestar Holding B.V.
Nijverheidsstraat 1
PO Box 9
4551 LA Sas van Gent
Holland

Patents ADP number *(if you know it)*

If the applicant is a corporate body, give the country/state of its incorporation — 5761051002

4. Title of the invention — "Texturizing agent for UHT treated products"

5. Name of your agent *(if you have one)*

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

Stevens Hewlett & Perkins
1 St. Augustine's Place
Bristol BS1 4UD
United Kingdom

1545002

Patents ADP number *(if you know it)*

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Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

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Number of earlier application	Date of filing *(day / month / year)*

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a) any applicant named in part 3 is not an inventor, or
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Continuation sheets of this form	-
Description	9
Claim(s)	2
Abstract	1
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Priority documents	-
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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	-
Request for preliminary examination and search *(Patents Form 9/77)*	-
Request for substantive examination *(Patents Form 10/77)*	-
Any other documents *(please specify)*	-

11. I/We request the grant of a patent on the basis of this application.

Signature Stevens Hewlett & Perkins Date 23/01/02

STEVENS HEWLETT & PERKINS

12. Name and daytime telephone number of person to contact in the United Kingdom — Mr S.J. Wilkinson — 0117 922 6007

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Texturizing agent for UHT treated products

Technical field

The present invention relates to UHT-treated products comprising starch n-alkenyl succinate and to the process for preparing these products. It further relates to the use of starch n-octenyl succinate as texturising agent in UHT-treated products.

Background of the invention

The last decades eating habits have put stress upon availability of convenience food. Thermal processes such as UHT (ultra-high-temperature) treatment have grown in importance for preparing convenience food.

WO 94/0437 describes a bakery custard comprising a UHT-stable starch. Said UHT-stable starch is either acetylated distarch adipate or hydroxypropyl distarch phosphate.

Currently there exists a need for a UHT-treated product wherein the texturising agent develops no viscosity during UHT treatment, but full viscosity is developed during a second heating treatment, while afterwards there is no significant change in this viscosity.

The current invention provides such a product.

Summary of the invention

The present invention relates to a UHT-treated product comprising starch n-alkenyl succinate as texturising agent. The viscosity of said product after UHT-treatment is between 0.10 to 0.50 times the viscosity obtainable after re-heating of said UHT-treated product, preferably between 0.15 to 0.40 times the viscosity obtainable after re-heating.

The present invention further relates to a UHT-treated product comprising starch n-alkenyl succinate wherein the alkenyl succinate is from C_6 to C_{16} succinate, preferably n-octenyl succinate. The starch alkenyl succinate is undextrinised, dextrinised, cooked-up, pregelatinised, enzyme-treated, or stabilised and/or mixtures thereof.

The present invention relates to a UHT-treated product selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings.

Furthermore, the present invention relates to a white sauce comprising from 2 to 5% w/w starch n-alkenyl succinate, preferably from 3 to 4% w/w starch n-alkenyl succinate, and its viscosity after UHT treatment is below 1500 MPa.s, preferably below 1000 mPa.s, whereas after re-heating the UHT-treated product the viscosity increases above 2000 mPa.s, preferably above 2200 mPa.s.

The present invention further relates to a process for preparing UHT-treated product characterised in that it comprises the following steps:

a) Preparing the mix of the ingredients comprising starch n-alkenyl succinate,
b) Preheating said mix,
c) Homogenising said preheated mix,
d) Treating the mix by UHT,
e) Cooling the UHT-treated product.

The present invention specifically relates to a process for preparing UHT-treated product wherein in step b) the mix is preheated to a temperature higher than 50°C, preferably to a temperature up to 75°C, in step c) said mix is homogenised at a pressure more than 20 bar, and in step d) the product is treated at a temperature higher than 120°C.

The present invention further relates to a process wherein the UHT-treated product of step e) is re-heated to a temperature higher than 80°C, preferably higher than 90°C.

The current invention further relates to the use of starch n-alkenyl succinate as texturising agent in UHT-treated product and especially to UHT-treated products selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings.

The present invention further relates to the use of starch n-alkenyl succinate in UHT-treated products as texturising agent wherein said texturising agent gives after UHT-treatment a viscosity which is only between 0.10 to 0.50 times the viscosity obtainable after re-heating of the UHT-treated product.

Furthermore, the present invention describes the use of starch n-alkenyl succinate as texturising agent in UHT-treated product wherein at least 50% egg yolk content of said product is replaced by starch n-alkenyl succinate.

Detailed description of the invention

The present invention relates to a UHT-treated product comprising starch n-alkenyl succinate as texturising agent. The viscosity of said product after UHT-treatment is between 0.10 to 0.50 times the viscosity obtainable after re-heating of said UHT-treated product, preferably between 0.15 to 0.40 times the viscosity obtainable after re-heating.

The starch used in the present invention may be from a variety of sources such as corn, waxy maize, potato, pea, rice, wheat, cassava (tapioca), sorghum, and the like, preferably waxy maize and tapioca.

The starch n- alkenyl succinate is characterised by the chain length of the alkenyl-group and by the substitution degree of n-alkenyl succinate on starch. Alkenyl can be from C_6 to C_{16}, preferably C_8 (octenyl), and the substitution degree varies between 0.2 to 3%, preferably between 0.5 to 2.5%. This substitution degree is determined by HPLC.

The starch alkenyl succinate is undextrinised, dextrinised, cooked-up or pregelatinised, enzyme-treated or stabilised and/or mixtures thereof.

For obtaining the stabilised starch n-alkenyl succinate, the starch n-alkenyl succinate can be treated with active chlorine and can be prepared according to the process described in EP 0811633.

The present invention further relates to a UHT-treated product wherein the starch n- alkenyl succinate is starch n-octenyl succinate and in a specific example starch is treated with n-octenyl succinic anhydride followed by the treatment with hypochlorite in an amount equivalent to 100 to 2000 ppm active chlorine and a high viscosity stable starch n-octenyl succinate is obtained.

Ultra-high-temperature treatment enables sterility to be achieved with minimal chemical change to the product.

Two methods of heat treatment are principally used in UHT processing: indirect heating, using hot water or steam, and direct heating, using steam.

Indirect heating systems are usually based on plate heat exchangers, tubular heat exchangers or scraped-surface heat exchangers.

Direct heat-exchangers use steam for product sterilisation. With the injection or steam-into-product system, a steam injector is used to introduce bubbles of steam into the product flow. The steam, at a higher temperature than the product, condenses to raise the product temperature to that required for sterilisation. An alternative to the injection system is the infusion or product-into-steam system. This is based on a steam pressure vessel with an infuser at the top and a conical base. Product passes through the steam atmosphere into the collecting cone. As the product falls, the temperature is raised through the contact with the steam. The heated product is then pumped through the holding tube into an expansion vessel for water removal and cooling. The type and lay-out of a UHT process will vary according to the products and requirements.

Surprisingly it is found by the current invention that products comprising n-alkenyl succinate, after UHT-treatment still have low viscosity. After UHT-treatment the viscosity is only between 0.10 to 0.50 times the viscosity obtainable after re-heating of said UHT-treated product. During the re-heating step, full viscosity of the product is developed and said viscosity remains stable after cooling and during storage of the product.

Currently, existing starch-based products used for UHT-treatment, such as acetylated distarch adipate or hydroxypropyl distarch phosphate, develop directly full viscosity during UHT-treatment and said viscosity increases further during the second heating step and during storage.

The current invention discloses UHT-treated products selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings.

In particular, the present invention relates to a white sauce comprising from 2 to 5% w/w starch n-alkenyl succinate, preferably from 3 to 4% w/w starch n-alkenyl succinate, and its viscosity after UHT treatment is below 1500 mPa.s, preferably below 1000 mPa.s, whereas during re-heating viscosity increases above 2000 mPa.s, preferably above 2200 mPa.s.

It is very important that during the heating of the UHT-treatment the texturising agent is not developing viscosity and that the starch granule is not damaged during this heating and shear process. This is a very striking difference with other starch based texturising agents for UHT-products. The comparative example clearly demonstrates that

hydroxypropylated distarch phosphate (tapioca based) already has significant increase of viscosity during UHT treatment, whereas UHT-treated products comprising starch n-octenyl succinate as texturising agent have low viscosity after UHT-treatment (example 1). When heating the product for a second time, then full viscosity is developed and after cooling and during storage there is no post-thickening effect observed for the UHT-treated product comprising starch n-octenyl succinate.

In fact, the current invention allows preparing UHT-treated products which are still liquid after said treatment, and develop only during a second heating step full viscosity. In particular, the viscosity of the UHT-treated product after UHT-treatment and viscosity after re-heating differs at least with 1800 mPa.s, values of up to 2900 mPa.s difference are observed.

The present invention further relates to a process for preparing UHT-treated product characterised in that it comprises the following steps:

a) Preparing the mix of the ingredients comprising starch n-alkenyl succinate,
b) Preheating said mix,
c) Homogenising said preheated mix,
d) Treating the mix by UHT,
e) Cooling the UHT-treated product.

The process steps c) and d) might occur either in sequence or simultaneously.

The present invention specifically relates to a process for preparing UHT-treated product wherein in step b) the mix is preheated to a temperature higher than 50°C, preferably to a temperature up to 75°C, in step c) said mix is homogenised at a pressure higher than 20 bar, and in step d) treatment is at a temperature higher than 120°C.

This latter treatment of step d) only lasts for a few seconds.

The process can be based on direct or indirect heating. Whichever method is used, the process is broadly the same, with heat treatment being followed by aseptic storage and aseptic packing of the product.

The current invention further relates to the use of starch n-alkenyl succinate as texturising agent in UHT-treated product. These UHT-treated products are selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings. Applying starch n-alkenyl succinate, especially starch n-octenyl succinate as texturising agents in

UHT-treated products gives products with low viscosity after the UHT process and full viscosity is developed when re-heated, while no post-thickening during storage is occurring. Such a post-thickening effect is observed with the products currently in use for UHT-treatment (see comparative example). These existing products also lack the advantage of the current invention that after UHT-treatment the products still have low viscosity. In fact, the UHT-treated products of the current invention are characterised in that the texturising agent gives after UHT-treatment a viscosity which is only between 0.10 to 0.50 times the viscosity obtainable after re-heating of the UHT-treated product.

The current invention especially relates to the use of starch n-alkenyl succinate in UHT-treated products wherein at least 50% of egg yolk content is replaced by starch n-alkenyl succinate. Example 1 trial T2 clearly demonstrates that a product, with a normal egg yolk-content of 1.5%, can be obtained by reducing the egg-yolk content to 0.75% and having starch n-octenyl succinate present in the product. By applying starch n-octenyl succinate as texturising agent in UHT-treated products, it partially is replacing egg yolk in the finished product and consequently the cholesterol content is significant reduced.

The UHT-treated product of the current invention has the following advantages:

- Low viscosity during UHT-heating, i.e. the product remains very liquid and there is no thickening during UHT treatment
- Starch granule is not damaged during this heat treatment and shear treatment at high temperature
- Thickening, i.e development of viscosity is obtained in a second heating step
- Full viscosity remains stable during cooling and storage and there is no post-thickening effect.
- Lower cholesterol content

The invention is illustrated by way of the following example.

Example 1 demonstrates that UHT-treated white sauce comprising starch n-octenyl succinate has low viscosity after said treatment, but viscosity is developed in a second heating step. Additionally it is demonstrated that similar results are obtainable when starch n-octenyl succinate is applied as texturising agent and as replacement for 50% of egg yolk in UHT-treated white sauce.

The comparative example demonstrates that hydroxypropylated tapioca diphosphate already during UHT-treatment develops its viscosity and that during second heating step viscosity is increased further and post-thickening effect is observed.

Example 1.

UHT-treated white sauce was prepared by applying the following recipe.

Recipe:

Ingredients (percentage)	T1	T2 –reduced egg content
Soya oil	10	10
Skimmed milk	4	4
Egg yolk	1.5	0.75 (= 50% of egg yolk)
nOSA highly stabilised tapioca starch	3	4
water	81.5	81.5

The following UHT-treatment (APV pilot plant) was applied:

Preheating: 75°C

Homogenisation: 25 bar

Heating: 138 – 140°C for 10 sec (tubular system)

Cooling: max.

The second heating was performed with Janke & Kunkel equipment and products were heated up to 95°C for 1 minute.

The products were characterised by their Brookfield viscosity (cyl. Spindle at 20 rpm and 20°C).

The obtained results are displayed in Table 1.

Table 1:

Brookfield viscosity (in mPa.s)	T1	T2
1 day after UHT-treatment		
Before re-heating	600	1300
After re-heating	2400	4200
1 week after UHT-treatment		
Before re-heating	700	1300
After re-heating	2500	4000
1 month after UHT-treatment		
Before re-heating	500	1300
After re-heating	2900	4400
3 months after UHT-treatment		
Before re-heating	700	1700
After re-heating	3600	4900

The products have low viscosity after UHT-treatment and high viscosity after second heating step. This is also applicable for products with reduced egg yolk content.

Comparative example

UHT-treated white sauce was prepared by applying hydroxypropylated tapioca diphosphate (75705 –obtained from Cerestar) and by applying the following recipe:

Recipe:

Ingredients (percentage)	Reference
Soya oil	10
Skimmed milk	4
Egg yolk	1.5
C☆CreamTex 75705 (Cerestar)	3
Water	81.5

The product was treated according to the parameters of example 1. The obtained Brookfield viscosities are given in Table 2.

Table 2

Brookfield viscosity (in mPa.s)	Reference
1 day after UHT-treatment	
Before re-heating	4000
After re-heating	4800
1 week after UHT-treatment	
Before re-heating	3900
After re-heating	4800
1 month after UHT-treatment	
Before re-heating	4500
After re-heating	4700
3 months after UHT-treatment	
Before re-heating	4000
After re-heating	4300

These products already have developed viscosity during UHT-treatment and afterwards during second heating there is further increase of viscosity.

Claims

1. A UHT-treated product characterised in that it comprises starch n-alkenyl succinate as texturising agent.

2. A UHT-treated product according to claim 1 characterised in that the viscosity of said product after UHT-treatment is between 0.10 to 0.50 times the viscosity obtainable after re-heating of said UHT-treated product, preferably between 0.15 to 0.40 times the viscosity obtainable after re-heating.

3. A UHT-treated product according to claim 1 or 2 characterised in that the alkenyl succinate is from C_6 to C_{16} succinate, preferably n-octenyl succinate.

4. A UHT-treated product according to anyone of claim 1 to 3 characterised in that the starch alkenyl succinate is undextrinised, dextrinised, cooked-up, pregelatinised, enzyme-treated or stabilised and/or mixtures thereof.

5. A UHT-treated product according to anyone of claims 1 to 4 characterised in that said product is selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings.

6. A white sauce according to claim 5 characterised in that:
   a) it comprises from 2 to 5% w/w starch n-alkenyl succinate, preferably from 3 to 4% w/w starch n-alkenyl succinate,
   b) viscosity after UHT treatment is below 1500 mPa.s, preferably below 1000 mPa.s,
   c) viscosity after re-heating increases above 2000 mPa.s, preferably above 2200 mPa.s.

7. A process for preparing UHT-treated product characterised in that it comprises the following steps:

a) Preparing the mix of the ingredients comprising starch n-alkenyl succinate,
b) Preheating said mix,
c) Homogenising said preheated mix,
d) Treating the mix by UHT,
e) Cooling of UHT-treated product.

8. A process for preparing UHT-treated product according to claim 7 characterised in that in step b) the mix is preheated to a temperature higher than 50°C, preferably to a temperature up to 75°C, in step c) said mix is homogenised at a pressure higher than 20 bar, and in step d) treatment is at a temperature higher than 120°C.

9. A process according to claim 7 or 8 characterised in that the UHT-treated product of step e) is re-heated to a temperature higher than 80°C, preferably higher than 90°C.

10. Use of starch n-alkenyl succinate as texturising agent in UHT-treated product.

11. Use according to claim 10 characterised in that said UHT-treated product is selected from the group consisting of sauces, soups, liquid desserts, dressings and fillings.

12. Use according to claim 10 or 11 characterised in that the texturising agent gives after UHT-treatment a viscosity which is only between 0.10 to 0.50 times the viscosity obtainable after re-heating of the UHT-treated product.

13. Use of starch n-alkenyl succinate according to anyone of claims 10 to 12 characterised in that at least 50% of egg yolk content of said UHT-treated product is replaced by starch n-alkenyl succinate.

Abstract

The present invention relates to UHT-treated products comprising starch n-alkenyl succinate. Said products have low viscosity after UHT-treatment, but full viscosity is developed after a second treatment and no post-thickening is observed. Starch n-octenyl succinate is used as texturising agent and as combined texturising agent and partial egg yolk replacement in UHT-treated products.